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THIRD EDITION, Supplement 3

CHECKING THE NET CONTENTS OF PACKAGED GOODS

as adopted by the 77th National Conference on Weights and Measures 1992

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- Statistical Engineering[2]
- Scientific Computing Environments[2]
- Computer Services[2]
- Computer Systems and Communications[2]
- Information Systems

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[1]At Boulder, CO 80303.
[2]Some elements at Boulder, CO 80303.

NIST HANDBOOK 133
THIRD EDITION
SUPPLEMENT 3

CHECKING THE NET CONTENTS OF PACKAGED GOODS

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Foreword

This supplement compiles the latest amendments adopted at the Annual Meeting in 1992 by the National Conference on Weights and Measures. It is the third supplement to be issued to the Third Edition of Handbook 133. The first supplement, which was published in September 1990, covered changes made to Handbook 133 in 1989 and 1990. The second supplement, published in October 1991, covered changes made to Handbook 133 in 1991.

The National Institute of Standards and Technology (NIST) has a statutory responsibility for "cooperation with the States in securing uniformity of weights and measures laws and methods of inspection." In partial fulfillment of this responsibility, the Institute is pleased to publish these recommendations of the National Conference.

Reason for and Use of This Supplement

Only minor additions and revisions to NIST (formerly National Bureau of Standards - NBS) Handbook 133, Third Edition, "Checking the Net Contents of Packaged Goods," were adopted by the National Conference on Weights and Measures in 1992. This supplement therefore consists of change pages to the Third Edition, as amended by the 1990 and 1991 supplements.

A list of changes that have been made to Handbook 133 and adopted by the Conference are listed on the next page as "Addendum - 1992"; the change pages that follow also include a few editorial changes necessitated by the conversion to a 2-column format. Please insert the "Addendum - 1992" page in front of page v and make the following changes to the Third Edition as amended:

Remove from H-133:	Replace with:
Pages 2-5 and 2-6	Change pages 2-5 and 2-6
Pages 3-39 through 3-53	Change pages 3-39 through 3-50
Chapter 5 contents page	Revised Chapter 5 contents page
Pages 5-17 through 5-19	Change pages 5-17 through 5-20
Appendix A contents page	Revised Appendix A contents page
Pages A-15 and A-16	Change pages A-15 and A-16
Pages B-17 and B-18	Change pages B-17 and B-18

In keeping with the move toward the primary use of metric measurements as recommended in the Omnibus Trade and Competitiveness Act of 1988, the National Conference on Weights and Measures Laws and Regulations Committee will introduce proposals to the voting membership in the 1993-94 work year that will add metric examples before customary unit examples wherever possible.

Addendum 1992

Section	Action	Page
2.3.1.(c).	Amended definition of inspection lot at point of pack.	2-6
3.17.	Amended title to include "Dry Pet Foods." Edited entire section to include references to Dry Pet Foods.	3-39
3.17.4.	Edited entire subsection to reference Dry Pet Foods. Added laboratory mill to a. Equipment, and included oven test procedures for Dry Pet Foods in b. Procedures.	3-42
3.18.2.h.	Updated addresses and telephone numbers of USDA regional offices.	3-49
Chapter 5 - Index	Added § 5.8. Baler Twine	-
§ 5.8.	Added Baler Twine Test Procedures	5-17
Appendix A	Flour Summary Sheet edited to include Dry Pet Foods	A-15
Appendix A	Added Baler Twine Worksheet	A-16
Appendix B	Table 3-3 amended to include Dry Pet Foods	B-17

Appendix G explains how to calculate a "range" (R). The actual number of "unreasonable errors" (box 16) and the criterion for individual package errors (box 17) are explained in Sections 2.7.1. (for Category A plans) and 2.8.1. (for Category B). The "average error" (boxes 18 and 19) is explained in Sections 2.7.2.

(Category A) and 2.8.2. (for Category B). The special additional steps (boxes 21 through 27) to determine lot conformance when following a Category A sampling plan (when the average error is a minus value) are described in Section 2.7.2.

The final disposition of the lot is recorded in box 28 and is a composite of the information recorded in boxes 17, 20, and 27.

2.3. Definition of the Lot

As a first step in package testing, the official designates the collection of packages upon which action will be taken as a result of the official's tests. This is the "INSPECTION LOT". Based on the factors likely to cause variations in quantity, the official should designate as the inspection lot the largest possible group of packages, in accordance with the following guidelines:

(i) The inspection lot must consist only of packages of the same product, with the same label, from the same packer.

For example, a lot shall consist of cans of peach halves, syrup added, 500 grams net weight, Brand X.

This rule should never be violated.

(ii) To the greatest extent possible, the inspection lot should consist only of packages packed at the same place, at the same time, under the same conditions. This guideline is in addition to the provisions of guideline (i). Therefore, a lot should consist of packages of the same product and the same label. They should also have the same lot code number if inspection is done at the warehouse, or be packages from the same filling line, packed during the same period, if inspection is done on-line at the packing plant. It is not absolutely necessary to sort by lot code when testing packages in a retail locations; a shipment or delivery may in fact be composed of packages with different lot codes.

It is not always possible to take the second guideline into account in designating lots. In fact, taking both guidelines into account may lead to a very small inspection lot, the result of which is undesirable. The inspection lot should be as large as possible without violating guideline (i), yet taking into account the factors mentioned in guideline (ii).

If the official cannot reach some packages because of physical or other constraints, those packages are not part of the inspection lot to be acted upon. In general, such restrictions on sampling should be avoided whenever possible.

State and local regulations apply to "lots," "shipments," or "deliveries." A shipment or delivery will rarely be comprised of only one or two packages. If only one or two packages are found on retail shelves, more packages should be sought in storerooms or cases. When only one or two packages are available for test in a single location and it is evident that the shipment or delivery was larger, the average net contents of the

shipment or delivery cannot be determined. Only individual package errors can be ascertained and compared with the limits of reasonable variation (called "MAV's"). If shortages are found for one or two packages, records should be kept and follow-up inspections conducted on larger lots or in other locations.

2.3.1. The Inspection Lot of Standard Pack Packages

"Standard pack" packages are defined as those packaged with identical labels in a few selected quantity sizes. For example, canned ham labeled "5 pounds" is a standard pack meat item. The packager "targets" the amount of product put into the package according to the net contents already selected to be on the package container's label.

The inspection lot must always consist of packages with identical labels (except for the lot code).

a. **When the location of test is a retail store:** Because state and local regulations apply to "lots, shipments, or deliveries," a shipment or delivery comprised of packages with different lot codes may be acted upon as a single inspection lot. Follow-up inspection will require segregation of lots by lot code.

b. **When the location of test is a warehouse:** The inspection lot must consist of packages with the same manufacturer's lot code.

c. **When the location of test is at a packing plant:** The inspection lot should consist of packages with the same manufacturer's lot code, or be from a single shift's production run. Inspection lots may represent as little as 1 hour's production. The inspector determines inspection lot size, which may be smaller or larger than the production lot defined by the packer.

Note that the inspection lot is not, in general, the same as the "production lot."

2.3.2. The Inspection Lot of Random Pack Packages

"Random pack" packages are defined as those packaged with identical labels except for the labeled quantity. These packages are usually individually weighed and subsequently marked with the net quantity.[1]

An example of a random pack meat item is whole chicken labeled by weight.

a. **When the location of inspection is a retail store:** An inspection lot may consist of all the packages packaged at that location and available for inspection at one time. Since the same production factors apply to all such packages, the entire meat counter, for example, may be considered the lot, except for those packages on the counter put up elsewhere than at the store. [See Appendix E for more discussion on selecting the sample from this kind of lot.]

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[1]*The NCWM Uniform Packaging and Labeling Regulation (NIST Handbook 130) defines a "random package" as "a package that is one of a lot, shipment, or delivery of packages of the same consumer commodity with no fixed pattern of weights." The procedures in this handbook for random pack packages apply to consumer and nonconsumer packages with quantity declarations of weight or of other measures.*

3.16.4. Action

If the net volume of commodity in the lightest package is less than the declared volume on the package, the lot is out of compliance and enforcement action should be taken. If the net volume of commodity in the lightest package equals or exceeds the declared volume on the package, the official may treat the lot as being in compliance on the basis of volume and take no further action. Alternatively, the official may take further steps to determine whether the lot was in compliance with net weight requirements at point of pack or was shortfilled by weight. To determine this, the official may do one or more of the following:

- perform a laboratory moisture loss analysis[1] to ascertain the weight of the original borax product when it was fully hydrated;

- obtain additional data at the location of the packager; and/or

- investigate the problem with the packager of the commodity.

3.17. Flour and Dry Pet Foods[2]

3.17.1. Background for Administrator and Inspector

The test procedure for these products is based on the concept of a "gray area" that extends down from the labeled weight to 97% of the labeled weight. It applies only to package lots checked at retail or wholesale, and not to those checked in the plant. The gray area does not represent a tolerance, nor do lots in the gray area automatically pass or fail. If the average weight of a package lot is in the gray area, the moisture content at time of test and at time of pack must be determined in order to judge whether the lot is in compliance.

a. **Enforcement action, inside and outside the gray area.** The overall objective is to test packages as routinely as possible. If package lots are short weight, but fall in the gray area, additional information must be obtained in order to decide whether or not the lots are in compliance. The usual enforcement action is to be taken on packages found short weight and outside the gray area. For package lots found short weight, but inside the gray area, a decision must be made as to what to do with the packages while additional information is being collected. It is recommended that a hold or stop sale order be put on these packages until their final status can be determined. If the product cannot be held and subsequent tests or information indicate that the lot is out of compliance, seek the strongest legal remedy.

b. **Which packages to consider as part of the lot being tested.** - When taking a sample from retail, an inspector will ordinarily record lot codes, but will not select the lot for test by sorting the packages by lot code. The sample is selected from all packages of the same brand, style, and size on the shelf or in the stock room. If short weight is found and the results are in the gray area, a follow-up test will now require sorting out the lot codes in order to ascertain the moisture content at the time of pack (which varies from one lot code to another).

c. **Package errors.** - The discussion below is based on recording the package weights as "package errors" -- how much and in what direction the actual package weight differs from the labeled weight. Thus, if a package labeled 2 lb actually weighs 2.10 lb, it is assigned a package error of +0.10 lb. The same holds for average package weights. If the average of 10 package weights is 1.994 lb, the average package error is (1.994 lb - 2.000 lb) = -0.006 lb.

d. **Package lots have to meet the average requirement and the individual requirement.** - Using H-133 Category B sampling plans[3] for packages not subject to possible moisture loss, two requirements must be met:

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[1] *Procedure available upon request from the Office of Weights and Measures, National Institute of Standards and Technology.*

[2] *Dry Pet Food is defined as pet food that is packaged in paperboard boxes and kraft paper bags and has a moisture content of 13 percent or less at time of pack. Moisture information is declared on the package in the ingredient statement.*

[3] *For simplicity only, this background discussion presupposes a Category B sampling plan test.*

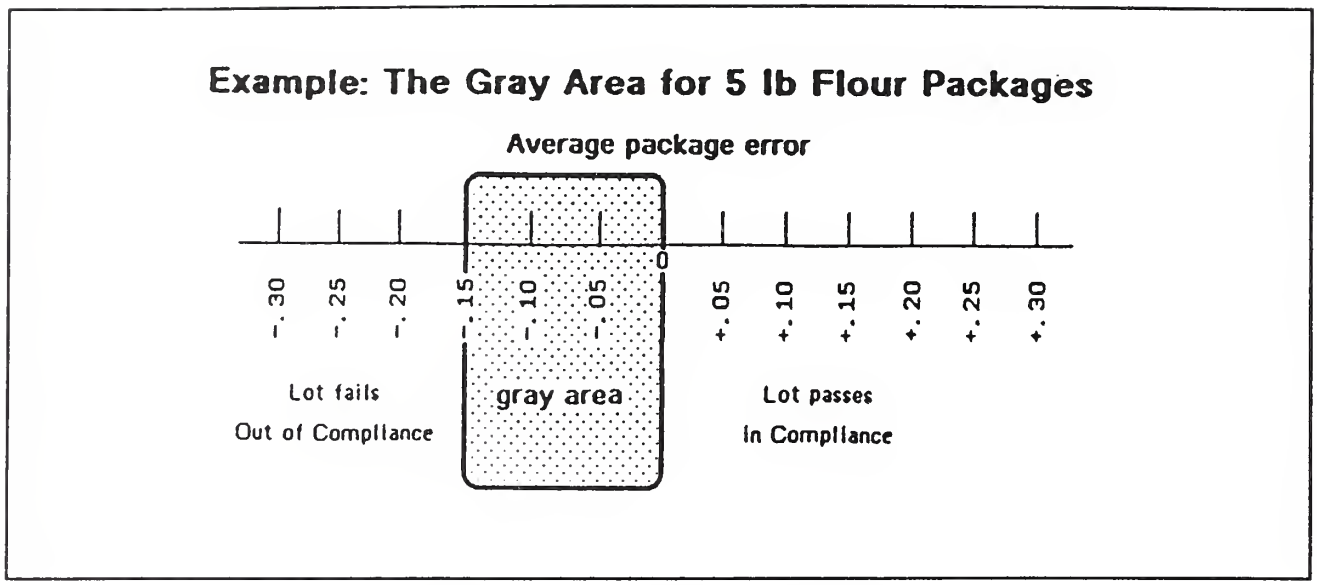

Figure 3-14. An example of a gray area.

(1) The average net weight of a sample of 10 or 30 packages must equal or exceed the labeled net weight. Thus, the average package error (for the 10 or 30 packages) must be zero or plus.

(2) In addition, no single package among the 10 or 30 packages in the sample can be short weight by more than the MAV.

For flour and dry pet foods, these two requirements become the upper boundary for the gray area. Ninety-seven percent of the labeled net weight defines the lower boundary of the gray area. (See Figure 3-14.)

For example, for 5-lb packages of flour, 3% of the labeled weight is 0.15 lb. Therefore, if the average package error for a lot of 5-lb packages is minus but between zero and -0.15 lb, the lot is in the gray area. The lot should be neither passed nor failed: more information is needed to decide its disposition.

If the official is following a Category B sampling plan, a package that is short weight by more than the MAV may put the lot in the gray area. The official will have to add the 3% gray area to the MAV to find the limits of the gray area for an individual package. Table 3-3 is provided to help the inspector determine whether or not the lot is in the gray area for all the common sizes of flour and dry pet food. This table is in **Appendix B.**

e. **How many lots will be in the gray area.** - The flour survey conducted by the NCWM Task Force on Commodity Requirements, printed in the Report of the 71st National Conference on Weights and Measures, 1986, page 70, is the source from which the estimates are predicted. If all flour samples are drawn from retail, an estimated 5 to 6 out of 10 lots will have a minus average error and will be in the gray area. This will vary according to the time of year of testing. Probably only one out of 100 lots found at retail would be rejected outright because of being outside the gray area. A survey on dry pet foods was conducted by the NCWM and the Pet Food Institute, it is printed in the Report of the 77th NCWM, 1992, page 150.

3.17.2. Field Equipment

Use Scales and Weights recommended in Section 3.1. (H-133) and glass canning jars (1/2 pint or larger) and lids.

3.17.3. Procedure

a. **Summary Sheet.** - A Flour and Dry Pet Food Summary Sheet is provided on page A-15 for use with the standard pack report form, page A-2. The following information can be entered on the Summary Sheet when setting up a test:

Type of Information	Examples	Item No. on Summary Sheet
Brands	Name of brand	Item 1

Type of Information	Examples	Item No. on Summary Sheet
Type of Product	all purpose flour, self-rising flour, whole wheat flour, or cat food, dog food, etc.*	Item 2
Labeled Wt.(lb)	2 5 10 to 100	Item 3
Location of Test	R, W, P, L R for retail, W for wholesale, P for packer's storage area, or L for on-line at the packaging plant.	Item 4

***Do not use this test for corn meal or mixes**

b. **Selection of Lots.** - When an inspection lot composed of packages bearing different lot codes is found in the gray area, sort the inspection lot by lot code. Re-define the inspection lot to be those packages bearing the same lot code. Record the lot code in item 5 on the Summary Sheet. The lot code is the packer's own identifying marks, not the universal product code (UPC). The size of the inspection lot, Item 6 on the Summary Sheet and box 5 on the Standard Pack Report Form, page A-2, is the number of packages with a single lot code available for inspection at one location.

Note on the summary sheet if there is no lot code. Contact the packager to determine if there is any identifying lot code information. (See Section 3.17.3.i. for how to contact the packager.)

c. **Sample Size.** - Record the sample size in Item 7 on the Summary Sheet and in box 6 on the Standard Pack Report Form, page A-2.

d. **Tare.** - Open the number of packages indicated in the sampling plan to get the average tare weight of the bag or other packaging material. (These packages may be in addition to the sample selected for net weight determination, if you prefer.) Record the average tare weight in Item 8 on the Summary Sheet and in box 13 on the Standard Pack Report Form.

e. **What a Package Should Weigh.** - Add the average tare weight to the labeled net weight to determine what the package is supposed to weigh, the "nominal gross weight."

average tare weight + labeled weight =
nominal gross weight

Record this value on the Standard Pack Report Form (page A-2, box 14.)

f. **Package Errors.** - Use the package checking scale to compare the packages in the sample with the nominal gross weight. A package that weighs more than the nominal gross weight is overweight and has a "plus package error." A package that weighs less than the nominal gross weight is underweight and has a "minus package error."

package error = package gross weight
- nominal gross weight

Record these values on the Standard Pack Report Form (page A-2).

g. **The Average Requirement.** - The explanation below follows a Category B sampling plan. (When following a Category A plan, compute T before determining whether the lot in question falls in the gray area.)

Compute the average error for the package lot under test. Sum all individual package errors and divide by the number of packages in the sample. Do not delete any individual package errors from the calculation. Record the average error on the Standard Pack Report Form in box 18, and in Item 9 on the Summary Sheet.

If the average error is zero or plus, the lot passes the average requirement.

Consult Table 3-3 in Appendix B to find the limits of the gray area for the labeled net weight. (According to the labeled weight in column 1, look up the limits of the gray area in column 2.) If a package size is not included in the table apply 3 percent to the labeled net weight. Note that the gray area only applies if testing is at retail or wholesale. If the test is conducted at the packaging plant, there is no gray area.

If the average error is minus by more than 3% of the labeled weight (assuming a category B test), the lot does not comply; it fails the test. Reject the lot and take the usual enforcement action. (Circle "no" in Item 11 on the Summary Sheet.)

If the average error is minus, but by less than 3% of the labeled weight, the lot is in the gray area. Go to that part of the procedure headed "What to do when the lot is in the gray area," Section 3.17.3.i. (Circle "yes" in Item 11 on the Summary Sheet.)

h. **The individual package requirement.** - Compare the largest individual minus package error on the standard pack report form with Table 3-3 (Columns 3 and 4) to

see if the lot is in the gray area. The Flour and Dry Pet Food Summary Sheet, page A-15, provides spaces for recording the largest minus package error (Item 10), and recording whether or not the lot is in the gray area (Item 11).

For example, if the package size is 2 lb, the MAV is 0.07 lb (column 3 of Table 3-3). For package sizes not listed in Table 3-3, see Table 2-8 (you will have to compute 3 percent of the labeled weight).

The size of the gray area is 3% of the labeled net weight; for 2 lb this is 0.06 lb. Therefore, an individual short weight package with a package error less than zero but not as much as -0.07 lb would not fail the lot. If the package error is larger than -0.13 lb (-0.07 lb ± 0.06 lb), the lot should be automatically rejected and enforcement action taken. But if the largest individual minus package error is between -0.07 lb and -0.13 lb, the lot is in the gray area. (See Table 3-3 columns 3 and 4.)

i. **What to do when the lot is in the gray area.** - Testing for moisture content is the only way to determine whether flour or dry pet food found short weight at retail or wholesale is short due to underpacking or due to moisture loss.

Fill a canning jar(s) with product from one (more than one package may be tested) of the packages opened for tare from the lot in question. Seal it with a canning lid, label it, and send it to the laboratory to run a moisture test. The results will be provided in terms of percent moisture content (for example, 10.3%). Record this in Item 12 on the Summary Sheet.

Contact the packager (for flour, see Milling Directory, available from the Millers' National Federation, 600 Maryland Ave., SW, Suite 305W, Washington, DC 20024, Telephone 202-484-2200; for pet food, see the membership directory of the Pet Food Institute, 1101 Connecticut Ave., Washington, DC 20036, Telephone: 202-857-1120) to obtain the moisture content value at the time of pack for the lot code in question. Record this in Item 13 on the Summary Sheet. The moisture content at time of pack will normally be between 13.5 and 14.0% for all-purpose and most types of whole-wheat, graham, etc., flours. Self-rising flour will be about 0.7% lower in moisture content (between 12.8 and 13.3%). If there is no lot code, assume a moisture content of 13.75% at the time of pack for all-purpose and all types of whole-wheat flour; 13% for self-rising flour.

Subtract the moisture content value at the time of test (**MCT**) from the moisture content at time of pack (**MCP**); this is the amount of moisture lost (**ML**) by the flour during distribution:

ML = MCP - MCT

Record the moisture loss in Item 14 on the Summary Sheet.

For example, if the moisture content at time of pack was reported to be 14% and the moisture content at time of test is 11%, the moisture loss is 14% - 11%, or 3%. A moisture loss of 1% translates directly into a weight loss of 1%. If you are testing 2-lb packages of flour, a 3% moisture loss is a weight loss of 2 lb x 0.03, or 0.06 lb. Calculate the weight loss for the lot under test by multiplying the percentage moisture loss by 0.01 (to convert it to a decimal) and then by the labeled weight (to convert it to pounds.) See Summary Sheet for calculation. Record the weight loss in Item 15 on the Summary Sheet.

For example, if a moisture loss of 3% is found for a 2-lb lot of flour, this is a weight loss of 0.06 lb (2 lb x 3 x 0.01).

If the moisture loss (in item 15) is equal to or larger than the amount of shortage found for the average error (in item 9), then the lot can be accepted. If the moisture loss is less than the average shortage, then the lot should be rejected and further enforcement action taken.

For example, assume the average package error for a 2-lb lot of packages is 0.05 lb. If a moisture loss of 3% is found, the weight loss of 0.06 lb (2 lb x 0.03) is more than the amount of shortage (0.05 lb), therefore, the lot would pass the average requirement. Record this in Item 16.

Similarly, if any individual minus package errors exceed the MAV, placing the lot into the gray area, add the amount of weight lost due to moisture loss (Item 15) to the largest individual minus package error (recorded in Item 10). If the resulting package error is still larger than the MAV (see Table 3-3, third column), the lot should be rejected. If the resulting package error is smaller than the MAV, the lot should be accepted. Record this in Item 17.

For example, if the largest individual package error for a lot of 2-lb packages is 0.08 lb, this puts the lot into the gray area, even if the average package error is zero or plus. If a moisture loss of 3% is found, the weight loss of 0.06 lb added to the individual package error makes the package error -0.02 lb (-0.08 lb + 0.06 lb). The MAV for 2-lb package lots is -0.07 lb, so this lot passes if the average is zero or plus.

3.17.4. Moisture Content Laboratory Test

a. Equipment

Forced-air (or equivalent) laboratory convection oven

Desiccator and drying agent
Analytical balance
Drying dishes with covers
Calibrated thermometer
Tongs or insulated gloves
Laboratory mill

b. Procedure

1. Set oven to 130°C for flour (135° C for dry pet foods) ±1°C. Let temperature stabilize.

2. Weigh at least three empty drying dishes and covers for each lot of product to be tested (that is, run a triplicate).

3. Weigh covered dishes with about 2 g of product in each one. Prior to weighing, pet food must be carefully ground using a laboratory mill so that the sample passes through a 1 millimeter (18 mesh) sieve with circular openings.

4. Uncover dishes, place them in the oven.

5. Start timing for 1 hour for flour (2 hours for dry pet food) from the time the temperature returns to within 1°C of the specified temperature.

6. Cover the dishes, transfer them to a desiccator, and weigh after the dishes return to room temperature.

7. Compute the moisture content (MC) (%) as follows:

$$MC = [(SWBD - SWAD) \div SWBD] \times 100$$

where: **SWBD** = sample weight before drying
SWAD = sample weight after drying

Do the calculation within the parentheses first. Then do the calculation within the brackets. Then multiply by 100.

8. Average the results on three dishes for each lot.

Exchange samples with packing plant in order to determine whether their laboratory results are equivalent to yours.

3.18. Meat and Poultry from Federally Inspected Plants

3.18.1. Background for Administrator and Inspector

These test procedures are for meat and poultry coming from Federally inspected plants. If inspectors check packages at wholesale or retail, use Category A sampling plans from H-133, and either unused or dried used tare (see Section 3.18.3.5. for definition), then there is no gray area; the tested packages are either in or out of compliance. If a jurisdiction uses wet tare (see Section 2.11. Tare, for definition), there is a "gray" or "no-decision" area. **The gray area is not a tolerance. If packages are found in the gray or no-decision area, they neither automatically pass nor fail the test. If lots are tested and found inside the gray area, they are not necessarily in compliance. The jurisdiction will have to do more work to determine the final status of the lot.**

Jurisdictions wishing to perform wet tare tests upon products for which no gray area has yet been determined will need to permit "reasonable variations" until a gray area has been determined for that product. New gray area determinations will be printed in this Handbook and in the Federal Register. Contact the USDA Regional Office for a listing of the products that have gray areas, as well as the size of their gray area percentages.

The size of the gray area is defined as a percentage of the labeled weight that extends downward from the labeled weight.

a. **Enforcement action relative to the gray area.** - The overall objective is to test packages as closely as possible to a routine test. However, one difference will immediately be apparent.

Category A (Table 2-2) sampling procedures must be employed at retail or wholesale locations when testing packages put up in a Federally inspected plant (because a test similar to a Category B test has already been run on the packages at the plant level).

Category B (Table 2-5) sampling procedures may be used when testing at the packaging plant.

b. **"Dry Tare" Jurisdictions.** - For jurisdictions that normally utilize unused tare to test meat and poultry packaged at a retail store, it will be necessary to simulate unused tare for packages from Federally inspected plants by drying out absorbent materials (if any) comprising the used tare and to determine a "dried used tare."

No additional information will be needed other than the results of a Category A test using "dried used tare" before taking enforcement action on lots.

c. **"Wet Tare" Jurisdictions.** - For jurisdictions that normally use wet tare, if the package lots are found short

weight with wet tare tests, but fall in the "gray area," it is necessary to collect additional information to determine whether or not the lot complies with net weight requirements.

If the package lots are found short weight using a Category A sampling plan and wet tare, it will first be necessary to determine whether the lot is inside or outside the gray area. If the lot falls in the gray area, additional information will have to be collected before reaching a final determination whether the lot is in or out of compliance. Of course, nothing additional will be needed for lots that fall outside the gray area. Appropriate enforcement should be taken on packages found short weight and outside the gray area.

A "hold" or a "stop sale" order should be put on packages found short weight, but inside the gray area, until their status can be determined. If this is not possible, the strongest legal remedy should be sought if the product cannot be held and subsequent tests or information indicates that the lot is out of compliance.

d. Which packages to consider as part of the lot being tested. - Ordinarily, an inspector taking a sample from retail will record lot codes, but will not select the lot for test by sorting the packages by lot code. He or she will simply select a sample from all packages of the same brand and style and size on the shelf or in the stock room. If short weight is found and the results are in the gray area (wet tare only), follow-up investigation requires sorting the lot codes at this point.

e. Category A sampling plans must be used for all tests conducted outside the Federally inspected plant. - See Section 3.18.3. for details. The discussion below is based on using these procedures and on recording the "package errors"--how much and in what direction the actual package weight differs from the labeled weight.

Thus, if a package labeled 2 lb actually weighs 2.010 lb, its package error is +0.010 lb. Similarly, the "average package error" is the difference between the average weight of the sampled packages and the labelled package weight. If the average of 10 package weights is 1.994 lb, the average package error is (1.994 -2.000 lb) = -0.006 lb.

f. Package lots must meet the average requirement and the individual requirement. - When checking packages not subject to possible moisture loss and using Category A sampling plans, two requirements must be met:

(1) The average net weight of the sample must equal or exceed the labeled net weight minus an adjustment factor called T, (see general discussion of T in Chapter 2 and in NCWM Training Module 10) which represents the possible deviation between the sample average and the actual lot average.

If a jurisdiction applies either unused or used dried tare to meat and poultry packages, this is sufficient to determine whether the average requirement has been met. See Figure 3-15.

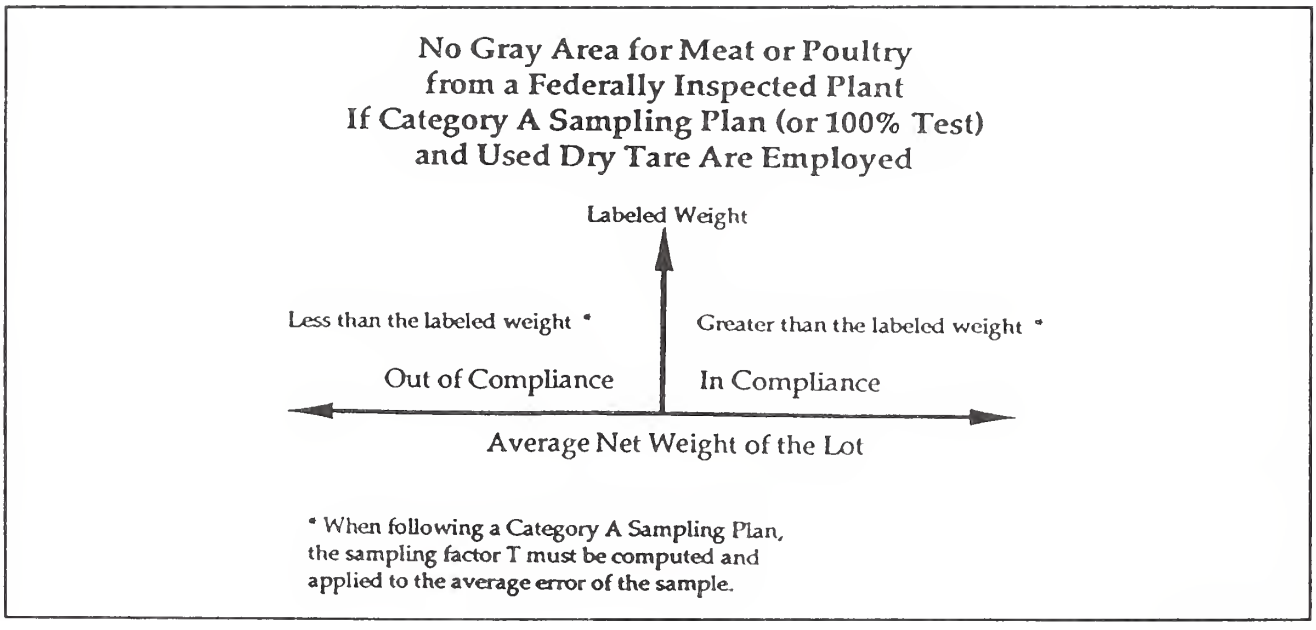
No Gray Area for Meat or Poultry
from a Federally Inspected Plant
If Category A Sampling Plan (or 100% Test)
and Used Dry Tare Are Employed
Labeled Weight
Less than the labeled weight *
Greater than the labeled weight *
Out of Compliance
In Compliance
Average Net Weight of the Lot
* When following a Category A Sampling Plan, the sampling factor T must be computed and applied to the average error of the sample.

Figure 3-15

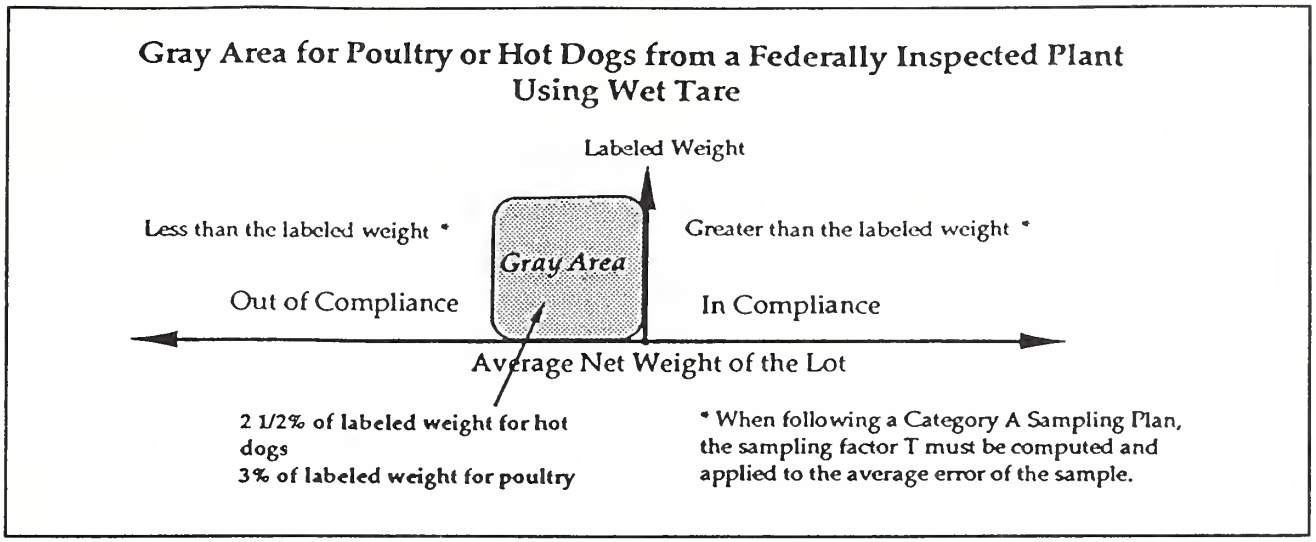
Gray Area for Poultry or Hot Dogs from a Federally Inspected Plant Using Wet Tare
Labeled Weight
Less than the labeled weight *
Gray Area
Greater than the labeled weight *
Out of Compliance
In Compliance
Average Net Weight of the Lot
2 1/2% of labeled weight for hot dogs
3% of labeled weight for poultry
* When following a Category A Sampling Plan, the sampling factor T must be computed and applied to the average error of the sample.

Figure 3-16

If a jurisdiction uses wet tare, an amount defined by the gray area must be considered before determining non-compliance of the lot under test without further information or data collection. See Figure 3-16.

The size of the gray area has been set at 3% of the average labeled weight for raw, fresh poultry, and 2-1/2% of the labeled weight for franks and hot dogs (whether made from meat or poultry).

(2) The number of packages that may fall below the MAV is specified in Category A sampling plans according to the sample size. Ordinarily, the inspector uses Table 2-8 to look up the MAV for packages labeled by weight.

USDA Meat and Poultry Inspection uses a set of MAV's for products under its supervision. These are given in Table 2-12. Use Table 2-12 for all products coming from a Federally inspected plant.

The size of the gray area must be added to the individual package limits specified in Table 2-12 when the jurisdiction uses wet tare.

g. What to do when the lot is in the gray area ("Wet Tare" Jurisdictions Only). - Contact the USDA Regional Director or the Inspector-in-charge at the packaging plant (see Section 3.18.3.h.) to determine what information (either USDA's or the plant's) is available at the plant to clarify the status of the lot in question. General guidelines are given in Section 3.18.3.h.

The jurisdiction also has the option of visiting the plant to collect its own data or, if the plant is located in another jurisdiction, asking the weights and measures officials in that jurisdiction to collect the necessary data. (Permission must be requested to test at the plant.)

3.18.2. Types of Products and Size of Gray Areas

a. Bacon. - The gray area is zero for bacon if there is no free-flowing liquid or absorbent materials in contact with the product and the package is cleaned of clinging material prior to tare weight determination; when there is no free-flowing liquid or absorbent materials in packaged bacon, wet tare and dried used tare are equivalent.

Whether you are following wet tare or dry tare procedures, wipe all packaging materials clean of fat and clinging moisture before weighing tare.

b. Fresh Sausage and Luncheon Meats. - Luncheon meats comprise any cooked sausage product, loaves, jellied products, cured products, and any sliced meat styled for placing on bread or similar products. This category of product does not include whole hams, briskets, roasts, turkeys, or chickens requiring further preparation to be made into ready-to-eat sliced product.

When there is no free-flowing liquid and no absorbent materials used in the package, there is zero gray area for fresh sausage or luncheon meats. Whether you are following wet tare or dry tare procedures, carefully clean and wipe all tare materials of fat and clinging moisture. Only when there is no free-flowing liquid inside the package and there are no absorbent materials in contact with the product, wet tare and dried used tare are equivalent.

c. **Franks/Hot Dogs.** - A gray area of 2-1/2% of the labeled weight is to be applied when wet tare tests are conducted.

d. **Fresh Poultry.** - For net weight determinations only, fresh poultry is defined as poultry above 26 °F. This is product that yields or gives when pushed with a person's thumb. A gray area of 3 percent of the average labeled weight of the sample is to be applied to raw, fresh poultry in retail packages when wet tare tests are conducted.

3.18.3. Procedure

a. **Field Equipment.** - Use Scales and Weights recommended in Section 3.1.

b. **Report Forms.** - Use either the Standard Pack-Weight Only-Report Form (page A-2) or the Random Pack Report Form (pages A-3 and A-4). Record the official establishment number from the USDA logo in the space provided underneath name and address.

c. **Selection of Lots.** - Refer to Section 2.3. for defining and selecting the inspection lot.

The lot codes are the packer's own identifying marks, not the universal product code (UPC). In many instances, the lot code may be represented by a "pull" or "sell by" date. Record the lot code on the report form.

d. **Sample Size.** - Select the sample according to the size of the inspection lot following a Category A sampling plan (Table 2-2, page B-3). Do not sort random-pack packages from lightest to heaviest as recommended in Section 3.8.1., step 2.

e. **Tare.** Select the tare sample as given in Table 2-2.

(1) **Unused or Dried Used Tare.** - Unused tare material is rarely available at retail or wholesale locations for lots packaged at Federally inspected plants. The tare weights printed on the shipping containers may not be accurate. Therefore, it is necessary for the inspector to reconstruct an unused tare weight by drying the used tare and weighing it. If the tare is composed of nonabsorbent materials, it can be cleaned and wiped in order to obtain a "dried used tare." The following technique should be followed to get "dried used tare" when absorbent materials are involved. Absorbed fats as well as absorbed water-based fluids must be dried out of these materials:

A fresh poultry package will be used as the example.

Shrink Wrap. - Open package shrink wrap, remove wrinkles from heat-seal area as much as possible, and wipe or pat dry with paper toweling or other suitable material. These procedures can be considered the model for how to clean any nonabsorbent tare materials.

Tray. - If tray is foam or plastic, rinse tray and wipe or pat dry. If tray is paper or cardboard, pat dry between sheets of toweling and lay tray on heating element of prepack scale or heat in microwave oven to dry.

Depending on the power of the oven, total times between 2 and 5 minutes may be necessary. Frequent short bursts of power (30-sec intervals), checking after each cycle, are better than a single 5-minute run. (The trays can burn if the drying cycle is too long.) The tray should be cool and dry to the touch before final weighing.

Soaker Pad. - Many soaker pads are composed of plastic sheets laminated with fibrous paper tissue. Peel the plastic sheeting away from the tissue (if possible), press the tissue between sheets of paper toweling, then dry the tissue on the heating element of the scale or in a microwave as described above for a paper tray. Wipe or pat the plastic sheeting dry and weigh it with the cooled tissue pad, tray, shrink wrap, and label. Do not attempt to rinse soaker pads--they will often disintegrate if loaded with water.

Depending on the surface area of the microwave oven tray and the size of the soaker pads, do not load more than two to five tare pads in a microwave at one time and do not stack them. Stacking or loading too many pads at one time will take more oven time and power, increasing the possibility of burning or charring the pads.

(a) **What a package should weigh using unused or dried used tare.** - Add the average "dried" tare weight (**ADTW**) to the labeled net weight (**LNW**) to determine what the package is supposed to weigh--the "nominal gross weight" (**NGW**):

ADTW + LNW = NGW

(b) **Package errors using unused or dried used tare.** - Use the package checking scale to compare the gross weight of the packages in the sample (**PGW**) with the nominal gross weight (**NGW**). A package that weighs more than the nominal gross weight is overweight and has a "plus" package error (**PE**); a package that weighs less than this is underweight and has a "minus" package error.

PE = PGW - NGW

Go to Section 3.18.3.f. on the average requirement.

(c) **Packages opened for tare determination** may be rewrapped by the supermarket provided that the USDA

logo does not appear on the package. The supermarket should contact the original packager if it intends to leave the brand name on the product when repackaging.

(2) Wet Tare.

(a) When there is no free-flowing liquid or absorbent materials in contact with the product, clean the tare materials of all clinging product and wipe dry. Weigh the wiped tare materials for the number of packages indicated in the sampling plan. Average the tare weights. Add the average tare weight (**ATW**) to the labeled net weight (**LNW**) to obtain the nominal gross weight (**NGW**):

ATW + LNW = NGW

Use the nominal gross weight (**NGW**) to compare with the gross weights of all the packages in the sample (**PGW**) to determine their package errors (**PE**):

PGW - NGW = PE

(b) Determining the net weight when there is free flowing liquid or absorbent packaging materials in contact with the product. - All free liquid is part of the wet tare. To avoid destroying too many packages:

(i) gross weigh two packages to be opened for tare, then

(ii) weigh solids inside;

(iii) get wet tare by subtracting solids weight from gross weight.

(iv) **AWTW + LNW = NGW**

where: **AWTW** = Average wet tare weight
LNW = Labeled net weight
NGW = Nominal gross weight

Use the alternative tare procedure (Section 2.11.4.) to determine whether to open more packages (i.e., whether the tare is too variable).

Packages opened for a wet tare test may be rewrapped by the supermarket provided that the USDA logo does not go on the package. The supermarket should contact the original packager if it intends to leave the brand name on the product when repackaging.

(c) Determining Package Errors. - If individual package net weights are measured:

PE = PNW - LNW

where: **PE** = Package error
PNW = Package net weight
LNW = Labeled net weight

A package that weighs more than the labeled weight is overweight and has a "plus package error." A package that weighs less than the labeled weight is underweight and has a "minus package error."

If an average tare weight and nominal gross weight are determined:

PE = PGW - NGW

where: **PE** = Package error
PGW = Package gross weight
NGW = Nominal gross weight

f. The Average Requirement. - Compute the average error for the sample. Sum all individual package errors and divide by the number of packages in the sample. Record the average package error in box 18 on the standard pack report form or box 20 on page 2 of the random pack report form.

If the average error is zero or plus, the lot complies with the average requirement. If the average error is minus, first compute T.[1] (See Section 2.7. in this handbook and Chapter 6 of the Inspector's Manual in Module 10 for further instructions if this procedure is unfamiliar to you.) Record T on the report form, and continue with subsections (1), (2), or (3) below as appropriate.

(1) Unused or Dried Used Tare for Bacon, Sausage, Luncheon Meats with No Free-Flowing Liquid or

[1]*Unless the lot is so small that the inspector is testing all packages in the lot (100% test). If this is the case, and the average error is minus, the lot fails if it is a dried used tare test; the lot may be in the gray area if it is a wet tare test.*

Absorbent Materials. - If the average minus error is larger than T, the lot does not comply with the average requirement; enforcement action should be taken. Also, follow the process outlined in Section 3.18.3.g.

(2) Wet Tare - Fresh Poultry.

(a) Compute 3% of the average labeled weight.

average labeled weight x 0.03 = gray area

There is space below column 8 of the Random Pack Report Form to compute the average labeled weight of the sample.

(b) Record this in the comments section as "gray area."

(c) If T was computed, add the gray area to T, calculated and recorded on page 2 of the random pack report form. Record in remarks section as "gray area + T."

(d) Compare value in box 20 with "gray area + T."

(e) If the value in box 20 is larger than the "gray area + T," the lot fails to comply. (Since box 20 will always have a minus value--or else you would not have calculated T--disregard the sign when comparing with gray area + T.) If the value in box 20 is between T and the gray area + T, go to Section 3.18.3.h. If the value in box 20 is less than T, the lot complies.

(3) Wet Tare - Hot Dogs or Franks.

(a) Compute 2-1/2% of the labeled net weight recorded in box 1 of the standard pack report form.

(value in box 1) x 0.025 = gray area (lb or oz)

(b) Convert to dimensionless units by dividing by the unit of measure in box 2.

gray area (lb or oz) ÷ box 2
= gray area (dimensionless units)

Record this in comments section as "gray area."

(c) Continue with (c), (d), and (e) as for Subsection (2), Wet Tare - Fresh Poultry.

g. The Individual Package Requirement. - Table 2-12 gives the limits for individual package errors for packages produced at Federally inspected plants. Use this table instead of Table 2-8 for looking up the MAV. The number of individual minus package error permitted to be larger than the "lower limit for individual weights" (see the righthand column of this table) is given in Table 2-2 (page B-3). Convert this value (or values if a random pack lot falls between groups) to dimensionless units and record on the report form.

(1) Dried Used Tare or No Free-Flowing Liquid. When conducting a dried used tare test or testing bacon, sausage, or luncheon meats with no free-flowing liquid or absorbent tare materials, compare the value(s) from Table 2-12 (converted to dimensionless units) with the minus package errors. If the number of minus package errors that exceed the limits of Table 2-12 is more than allowed by the Category A plan being followed, the lot does not comply.

Wet Tare. - When conducting a wet tare test on hot dogs or fresh poultry, the size of the gray area must be added to Table 2-12 value(s) before counting the number of packages that exceed the MAV. In Section 3.18.3.f. the size of the gray area (in dimensionless units) was recorded in the comments area of the report form. The values from Table 2-12 are recorded in boxes 10 and 11 on the random pack report form and box 4 on the standard pack report form. Add the size of the gray area to the value(s) from Table 2-12 (converted to dimensionless units) before comparing with the minus package errors.

If the number of minus package errors that are greater than (Table 2-12 + the gray area) exceeds the number permitted in Category A plans, the lot does not comply. If minus package errors fall between the Table 2-12 value and (Table 2-12 + the gray area), they place the lot in the gray area if the number of these types of minus package errors exceeds the number permitted in Category A plans.

h. What to Do When the Lot Is in the Gray Area. - Although the following discussion is intended primarily for those jurisdictions using wet tare for meat and poultry, any jurisdiction is encouraged to follow these procedures when product from Federally-inspected plants fails to comply with net weight tests.

The "Meat and Poultry Inspection Directory" is available from the USDA Regional Offices listed on the next page.

Meat and poultry packaging plants are listed by "establishment number." Use the establishment number on the package to look up the location and telephone number of the plant. A separate number is sometimes provided for the USDA Inspector-in-charge. If the establishment number is not listed in this directory (since new businesses, established after the directory was published, may not be listed in the directory), call the Regional Office to get the telephone number(s) of the plant and the appropriate USDA official for the plant in question.

USDA Regional Offices	States or Territories
Western Regional Office 620 Central Avenue, Bldg. 2C Alameda, CA 94501 415/273-7788	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming, North Dakota, South Dakota, Samoa, and Guam
Southwestern Regional Office 1100 Commerce Street Dallas, TX 75242 214/767-4508	Arkansas, Kansas, Louisiana, Missouri, New Mexico, Texas, and Oklahoma
North Central Regional Office 11338 Aurora Ave Des Moines, IA 50322 515/284-6338	Illinois, Indiana, Iowa, Michigan, Minnesota, Nebraska, Wisconsin, and Ohio
Southeastern Regional Office 1718 Peachtree Street, NW Atlanta, GA 30309 404/347-2306	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, West Virginia, Puerto Rico, and the Virgin Islands
Northeastern Regional Office 701 Market St., 2-B South Philadelphia, PA 19106 215-597-8706	Connecticut, Maine, Maryland, Massachusetts, Delaware, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and the District of Columbia

Contact the appropriate USDA official to determine what information is available on the lot in question (see subsection (1) below). If a lot of hot dogs or fresh poultry has been tested using wet tare, any average package error that is minus and larger than T may place the lot in the gray area.

(1) **Further Information.** - Ask the USDA official:

(a) Whether the plant is operating under a "Total or Partial Quality Control Program" (TQC or PQC).

Some plants operate under a Federally approved "Total or Partial Quality Control Program." If such a program is in place, records on the lot in question will be maintained by the establishment, not by USDA. If the establishment is not operating under a TQC or PQC Program, USDA may or may not have tested the lot in question. The USDA official will be able to tell you what information he has, as compared with information that may be available from the plant personnel.

(b) What information is available from USDA concerning the particular lot in question.

- How many packages are tested at what time intervals?
- How many packages are produced in that time interval?
- What criteria are employed to decide when adjustments to the net weight are required?
- What were the net weight checks on the lot in question?
- What adjustments were made to the target weight?

If USDA has data on the specific lot in question or if there is an approved TQC or PQC program producing data on the lot, these data may serve to substantiate that the lot complied with net weight requirements when it left the plant. If data on the specific lot in question were not collected by USDA or under an approved QC program, the weights and measures test results are the only regulatory agency data on the lot. In this instance, the weights and measures authority should take whatever action is deemed appropriate; USDA has no data to dispute the weights and measures findings.

(c) What scale maintenance and testing program is in place in the plant.

(d) What tare verification system is in place in the plant, including how the tare is determined, how often it is monitored, how it is verified when new tare materials are delivered.

(e) What kind of net weight verification or testing (and how often) the USDA official conducts.

(f) Who are the establishment personnel to contact to review establishment-maintained records on the lot in question.

(2) Test Packages and Scales at the Packaging Plant. - Optionally, make arrangements to visit the plant or call the weights and measures jurisdiction where the plant is located. Discuss the net weight control program with plant quality control personnel, check their scales (if possible), and test packages. Even though it is not possible to test the lot in question at the plant, it may be possible to establish confidence in plant process and weight control procedures.

Note the type of scales used to monitor the fill weights of the packages. Ask to test the scales. (This may be disruptive during a production run.)

Test a sample of packages from the line or storage area using H-133 Category B sampling procedures plus the Table 2-12 values for individual packages. Since you are at the packaging plant and no distribution has occurred, there is no gray area to consider at this point. Due to the large number of packages in the lot when testing at the plant, the sample size will usually be 30 packages. Ask the USDA inspector if he or she will conduct a test using his procedures and equipment on the same lot.

(3) Other Optional Information That May Be Available from the Packer. - When testing at the packaging plant, this is the appropriate time (or it may be necessary to explore the issue by telephone) to get some optional information. The information below may be proprietary and not available to the inspector.

- How many packages are produced in a single production run? How much of the plant's production does each lot code represent (a single line's run, 8 hours/24 hours production, etc.)?

- What is the target weight for each label? How is this value set? (This will be considered confidential information.)

- What scales or other measuring equipment and procedures are used to measure or control the package net weights (checkweighers; line supervisor weighs a package every hour, etc.)?

- How quickly can adjustments be made to package fill targets that are found out of bounds?

- How often are the scales tested; who does the testing (yearly service call; quality control supervisor on a daily basis, etc.)?

- How does the plant determine the tare weight, how often does the plant change the tare weight, what does the plant do with tare information?

- (For example: actual tare unit used and changed whenever new shipment of tares sent; average weight to closest 0.01 lb is added to target weight; etc.)

- Does the packager report different tare weights to different areas of his market? (For example: wet tare values, unused tare values, something in between.) How are these determined?

- What variation in package weights from the labeled declaration does the line or plant normally encounter? (Ask them to show you or send copies of their records. These records are proprietary and may be available only for viewing.)

CHAPTER 5. METHODS OF TEST FOR PACKAGES LABELED BY COUNT, LINEAR MEASURE, AREA, THICKNESS, OR COMBINATIONS OF QUANTITIES

5.1. Packages labeled by count when the labeled count is 51 or more units per package

5.2. Packages labeled by count when the labeled count is 50 or fewer units per package

5.3. Packages labeled by linear or square (area) measure

5.4. Polyethylene sheeting

5.5. Paper plates

5.6. Sanitary paper products

5.7. Pressed and blown glass tumblers and stemware

5.8. Baler Twine

5.7.1. Procedure

This section describes how to test tumblers and stemware which are labeled by count and capacity. The package count must meet the requirements for the average. The individual units (tumblers, stemware) must meet the requirements for capacity, which for pressed and blown products is an "allowable difference" requirement. Equipment is the same as recommended in Section 4.14.1.

1. Determine inspection lot, and follow the procedures in Section 5.1. or 5.2. (depending on the labeled count) to determine conformance of the lot with respect to count.

If the lot conforms to requirements for count, go on to step 2 below.

2. The packages selected for the sample to be tested for count may also be used to test for capacity. Since a different sampling plan will be used, a different sample size may be needed.

For example, an inspection lot of 7 oz, 12 count, glass tumblers is composed of 500 packages. Referring to Table 5-1 (page B-22), a sample size of 10 is selected to be checked for count. The lot is found to conform to the average requirements for count. Referring to Table 5-2 (page B-23), a sample size of 10 is adequate for checking the labeled capacity. Therefore, the same 10 packages are checked for capacity.

Every package is checked. [No tare sample is needed.]

The capacity of each container in the package is determined.

3. Follow Section 4.14.2., steps 2, 3, and 4 on each item to be checked. Use separate worksheets and report form from those used to record labeled count.

4. The tumbler error is equal to the measured volume capacity minus the labeled capacity. Note on the report form to refer to the worksheet(s) for the appropriate individual tumbler error.

5. Compare each tumbler/stemware error with the allowable difference. Circle any error that exceeds the allowable difference (either positive or negative error).

6. Compare the total number of circled errors with Table 5-2, column 4 value, corresponding to the sample size.

For example, if the sample size is 30, only one tumbler/stemware error in the sample may exceed the allowable difference.

If the number of circled errors is more than the column 4 value of Table 5-2, the lot fails to conform to the package requirements. If the number of circled errors is less than or equal to the value in Column 4 of Table 5-2, the lot conforms with the package requirements.

5.8. Baler Twine - Test Procedure for Length

5.8.1. Equipment

- Measuring tapes as recommended in § 5.3.1. Determine measurements of length to the nearest division of the appropriate tape or rule.

- A hand-held calibrated straight-face spring scale of at least 5-kg (10 lb) capacity or a cordage testing device (similar to the one illustrated in Figures 1 and 2) that applies the specified tension to the twine being measured. When measuring twine samples or total roll length, apply 5 kg (10 lb) of tension to the twine. Accurate measurement requires the application of tension to the ends of the twine before measurement in order to straighten the product.

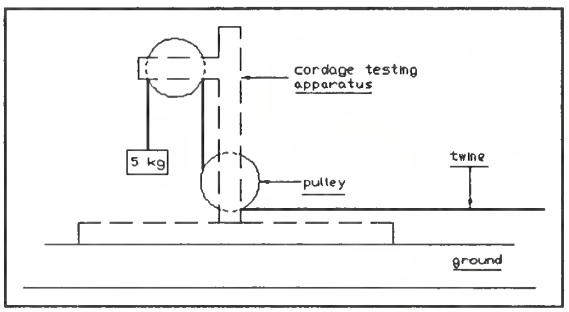

Figure 1 Cordage Test Device

- Scale with 0.1 gram - (0.0002 lb) increments for weighing twine samples. The recommended minimum load for weighing samples is 20 d.

- Scale as recommended in 3.1. for weighing bales and rolls of twine.

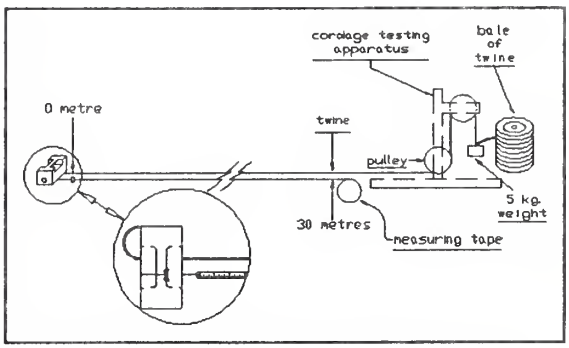

Figure 2 Cordage Test Device in Use

5.8.2. Procedure

When the term "box" is used, this refers to spaces on the Standard Package Report Form (Page A-1). The term "item" refers to spaces on the Baler Twine Worksheet (Page A-17).

1. Determine the inspection lot; fill out a Standard Package Report Form (Page A-1). A separate report form and baler twine worksheet should be filled out for each lot.

2. Select packages for tare samples. Determine gross weights of tare sample lot and record in item 1. Open the tare samples, determine the tare weight, and record in item 2. Compute the average tare weight and enter this value in item 2a and box 13.

3. Procedure for obtaining twine samples - select, at random, four balls of twine from the packages that were opened for tare. From each of the four balls of twine:

a. Measure and discard the first 10 meters (33 ft) of twine from each roll.

b. Take two 30-meter (100 ft) lengths of twine from inside each roll.

c. Weigh and record the weight of each piece separately and enter the values in item 3. Compare the weight values to determine the variability of the samples. If the individual weights of the twine samples vary by more than the amount specified in Table 4.3., one of the following steps should be taken if the lot is found to be short:

- Determine the actual length of the lightest-weight roll found in the lightest-weight package of the lot to confirm that the weight shortages reflect the shortages in the length of the rolls or;
- Determine the average weight-per-unit of measure by taking 10 30-meter (100 ft) lengths from inside the lightest weight package and use this value to recalculate its length and determine lot compliance.

d. Weigh all of the sample lengths together and enter the total value in item 4. Determine the total length of the samples (800 meters or feet, unless more than 8 sample-lengths were taken) and record the value in item 5. Compute the average weight-per-unit-of-length by dividing the total weight (item 4) by the total length of the pieces (item 5).

4. Determine the MAV for a package of twine (see item 7):

a. Determine total declared package length and enter this value in item 7a.

b. Multiply the MAV from Table 2-11 times the total package length to obtain the MAV for length. Enter this value in item 7b.

c. Multiply the weight per unit of length (item 6) times the MAV for length (7b) to obtain the MAV by weight. Enter this value in item 7c and box 3.

d. Convert the MAV to dimensionless units and record in box 4.

5. Calculate the nominal gross weight and record it in item 9 and box 14.

6. Compute the package errors for the tare sample on the worksheet and transfer these values to the cross-hatched area of the report form. Use the information obtained from the worksheet to conduct the lot inspection. Determine errors using the following formula:

Package error (weight) = (actual package gross weight) - (nominal gross weight).

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REFERENCES

(1) R. S. Elder, "Determining Tare in Net Weight Acceptance Sampling," Journal of Quality Technology, 4, p. 131-133, 1972.

(2) Factors for High Precision Conversion, U.S. Customary and Metric Units, NIST LC 1071, July 1976.

(3) Federal Specification GG-S-764C, Federal Specification, Stopwatch, Laboratory, February 26, 1974.

(4) Federal Specification NNN-B-00789a (GSA-FSS), Interim Federal Specification Buret, Straight, Precision, May 19, 1965.

(5) Federal Specification NNN-P-395C, Federal Specification Pipet, Volumetric (Transfer), March 13, 1970.

(6) S. Hasko, "Weight Checking of Aerosols," Modern Packaging, 38, 141-45, p. 192-93, 1965.

(7) William Horwitz, ed., Official Methods of Analysis of the Association of Official Analytical Chemists, Twelfth Edition, AOAC, Washington, DC, 1975.

(8) M. W. Jensen and R. W. Smith, The Examination of Weighing Equipment, NIST Handbook 94, U.S. Government Printing Office, Washington, DC, 1965.

(9) B. C. Keysar, Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures; 2. Specifications and Tolerances for Field Standard Measuring Flasks, NIST Handbook 105-2, U.S. Government Printing Office, Washington, DC, 1971.

(10) G.N. Lauer, "Probabilities of Noncompliance for Sampling Plans in NIST Handbook 133," Journal of Quality Technology, 14, p. 162, July 1982.

(11) J. Lembeck, The Calibration of Small Volumetric Laboratory Glassware, NIST Interagency Report 74-461, 1974.

(12) L. E. Moses and R. V. Oakford, Tables of Random Permutations, Stanford University Press, Stanford, CA, 1963.

(13) National Conference on Weights and Measures National Training Program, Module 10, "Checking the Net Contents of Packaged Goods," 1986.

(14) Office of the Federal Register, National Archives and Records Service, General Services Administration, Code of Federal Regulations, U.S. Government Printing Office, 1988.

(15) Report of the 71st National Conference on Weights and Measures, 1986, NIST Special Publication 725, p. 70.

(16) Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications, ASTM D-4397-84, 1984.

(17) Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, NIST Handbook 44, 1988.

(18) T. M. Stabler, Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures, 1. Specifications and Tolerances for Field Standard Weights (NIST Class F), NIST Handbook 105-1, 1972.

(19) Standard Method of Test for Volume of Peat Materials, ASTM D2978-71, 1971.

(20) Standard Method of Test for Yarn Number by the Skein Method, ASTM D1907-75, 1975.

(21) Standards Methods of Testing Twine Made from Bast and Leaf Fibers, ASTM D1233-73, 1973.

(22) Standard Specification for Polyethylene Film and Sheeting, ASTM D2103-86, 1986.

(23) Standard Test Methods for Thickness of Solid Electrical Insulation, ASTM D374-79, 1979.

(24) Standard Tolerances for and Methods of Testing Single Jute Yarn, ASTM D541-71, 1971.

(25) Uniform Laws and Regulations as Adopted by the National Conference on Weights and Measures, NIST Handbook 130, 1988.

(26) U.S. Department of Defense Military Standard, Sampling Procedures and Tables for Inspection by Attributes (MIL-STD-105 D), U.S. Government Printing Office, Washington, DC, 1963.

(27) H. Wagenbreth and W. Blanke, "The Density of Water in SI Units and in the International Practical Temperature Scale of 1968," PTB-Mitteilungen, p. 412-415, June 1971.

(28) O. K. Warnlof, Examination Procedure Outlines for Commercial Weighing and Measuring Devices, NIST Handbook 112, 1973.

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FLOUR AND DRY PET FOOD SUMMARY SHEET

DATE TESTED	
1. BRAND	
2. TYPE OF PRODUCT	
3. LABELED WEIGHT (LB)	
4. LOCATION OF TEST (RWPL)	
5. LOT CODE	
5A. LOCATION PACKED	
5B. DATE PACKED	
6. LOT SIZE	
7. SAMPLE SIZE	
8. TARE WEIGHT	
9. AVERAGE PACKAGE ERROR (LB)	
10. LARGEST MINUS PACKAGE ERROR (LB)	10A. MAV (LB)
11. IS LOT IN GRAY AREA? (SEE TABLE 3-3)	YES NO
12. MOISTURE CONTENT AT TIME OF TEST (%)	
13. MOISTURE CONTENT AT TIME OF PACK (%)	
14. MOISTURE LOSS (LB) = (ITEM 13.- ITEM 12.)	
15. WEIGHT LOSS (LB) = (ITEM 14. X 0.01 X ITEM 3.)	
16. IS WEIGHT LOSS (ITEM 15.) AT LEAST AS LARGE AS AVERAGE PACKAGE ERROR (ITEM 9.)?	YES-LOT PASSES AVERAGE REQ. NO
17. DOES LARGEST MINUS ERROR (ITEM 10.) + MOISTURE LOSS (ITEM 15.) STILL EXCEED MAV (ITEM 10A)?	YES NO -LOT PASSES INDIVIDUAL REQ.

Baler Twine Worksheet

Packages	1	2	3	4
1. Gross	_____	_____	_____	_____
2. Tare	_____	_____	_____	_____

2a. Average tare_____. Record in box 13 of report form.

3. Weights of sample lengths of baler twine. Length of each piece _____.

_____ _____ _____ _____

_____ _____ _____ _____

4. Determine the total weight of all sample pieces in 3 _____.

5. Determine the combined length of all sample pieces in 3 _____.

6. Compute the average weight per unit of length (divide 4 by 5) _____.

7. Determine the MAV.

a. Compute total declared package length: _____.

b. Compute the MAV for total package length. (MAV from table 2-11 x 7a) _____.

c. Compute _____ the MAV (multiply 6 x 7b) for total package weight and enter it in box 3.

9. Compute the nominal gross weight for a package. (Enter in box 14.)

Nominal gross weight _____ = (multiply 6 x 7a) + Average Tare (2a).

Table 3-2. Test allowances for Foam Aerosol Products

Avoirdupois: Labeled weight of package		Test allowance	
		Ounce	Pound
0 to less than	1-1/2 oz	0	0
1-1/2 oz to less than	5 oz	1/16	0.004
5 oz to less than	8 oz	1/8	0.008
8 oz to less than	11 oz	3/16	0.012
11 oz to less than	14 oz	1/4	0.016
14 oz to less than	1 lb 1 oz	5/16	0.020
1 lb 1 oz or more		3/8	0.023
SI Metric Labeled weight of package		Test allowance Grams	
0 to less than	50 g	0	
50 g to less than	100 g	1	
100 g to less than	200 g	3	
200 g to less than	300 g	5	
300 g to less than	400 g	7	
400 g to less than	500 g	9	
Over 500 g		10	

Table 3-3. Boundaries of the Gray Area for Different Sizes of Flour and Dry Pet Food* Packages

The retail or wholesale lot is in the gray area if:			
Column 1	Column 2	Column 3	Column 4
the labeled weight is:**	the average package error is minus and is between zero and 3% of label weight:	and any individual package error is minus and is between the MAV and	MAV + 3%
2 lb	-0.06 lb	-0.07 lb	-0.13 lb
5 lb	-0.15 lb	-0.14 lb	-0.29 lb
10 lb	-0.30 lb	-0.22 lb	-0.52 lb
20 lb	-0.60 lb	-0.31 lb	-0.91 lb
25 lb	-0.75 lb	-0.37 lb	-1.12 lb
50 lb	-1.50 lb	-0.50 lb	-2.00 lb
100 lb	-3.00 lb	-2.00 lb	-5.00 lb

*Dry pet foods are defined as those that are packaged in paperboard boxes or kraft paper bags and have a moisture content of 13 percent or less at the time of pack. Moisture content information is declared in the nutrition and ingredient statement on the package. **If a package size is not listed, apply 3 percent to the labeled net weight.

Table 4-1. Weighing devices appropriate to use to check common consumer products labeled by liquid volume.

Labeled volume (inch-pound)	Device	Labeled volume (metric)
Up to and including 4.25 fl oz	analytical or other high accuracy balance	Up to and including 126 mL
Greater than 4.25 fl oz to and including 32 fl oz	small capacity equal-arm scale or equivalent	Greater than 126 mL to and including 1 L
Greater than 32 fl oz to and including 3 gal	large capacity equal-arm scale or equivalent	Greater than 1 L to and including 12 L
Greater than 3 gal	commercial scale and substitution weighing	Greater than 12 L

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